Precalc Warm Up # 13-2

Solve:

1) $\{x \mid 3^{x+1} = 3\sqrt{3}\}$

2) $(x-5)^{x^2+3x-10} = 1$

3) $(x+7)^{x^2-4} = 1$

Simplify:

4) $\sqrt[3]{x\sqrt{x}}$

5) $\dfrac{8^x(\sqrt{2})^{5x}}{2^{3x}}$

6) $\dfrac{3^{n+2}+27}{18}$

Final Exam:

You may use your own grapher. Your notes must be in your own handwriting. You will turn them in after the final and may have them back next trimester.

Bring: Pencils, eraser and something to do when you finish.

Final Exam Rev WS #1 Answers:

1a) $2x^2+5x+7+\frac{26}{2x-3}$

b) $2x^2+7x+10+\frac{11x-21}{x^2-2x+2}$

2a) $r=105$ b) $f(2)=105$

c) $r=-15$ d) $f(-4)=-15$

3) $(x-2)(x+3)(x-3)$

4a) $\frac{16}{13}+\frac{15}{13}i$ b) 1

c) $\frac{3\sqrt{2}-2}{7}$ d) $-2\sqrt{10}$

5) $S_{1250}=2,345,625$

6a) $h=3$ $k=1$

b) $a=2$

c) $y=2x^2-12x+19$

$y=2(x-3)^2+1$

7ai) $A=\frac{4}{3}$ ii) $B=-4$

b) $A_\Delta=\frac{8}{3}$

8) $k=\frac{9}{4}$

9a) 1730 m b) 50,180 m

10a) 4 b) $t\approx 4.90$ hrs

Final Exam Rev WS #1 Answers:

11ai) $p=2$ ii) $q=10$

b) Reflect in x-axis

12a) $P\approx 1,536,101$ people

b) 28% growth

c) $n>\approx 20.7 \rightarrow 21$ yrs. by 2015

14a) as $x\to-\infty$, $f(x)\to\infty$

as $x\to\infty$, $f(x)\to\infty$

b) as $x\to-\infty$, $f(x)\to\infty$

as $x\to\infty$, $f(x)\to-\infty$

c) as $x\to-\infty$, $f(x)\to-\infty$

as $x\to\infty$, $f(x)\to-\infty$

15) $x=2,8$

16) $x=3$; $y=-9$

17a) center $(4,-1)$ $r=\sqrt{3}$

b) center $(-\frac{5}{2},3)$ $r=\frac{\sqrt{73}}{2}$

18a) 23 b) $6x^2-7$

Some answers to the final exam review:

1. d
2. c
3. a
4. d
5. a
6. b
7. c
8. d
9. c
10. d

11. a

12a) $\frac{2\sqrt{25}}{5}$

12b) $3\sqrt[4]{2}$

13a) $(-3, 2)$

b) $(-\infty, 2) \cup (5, \infty)$

c) No Solution

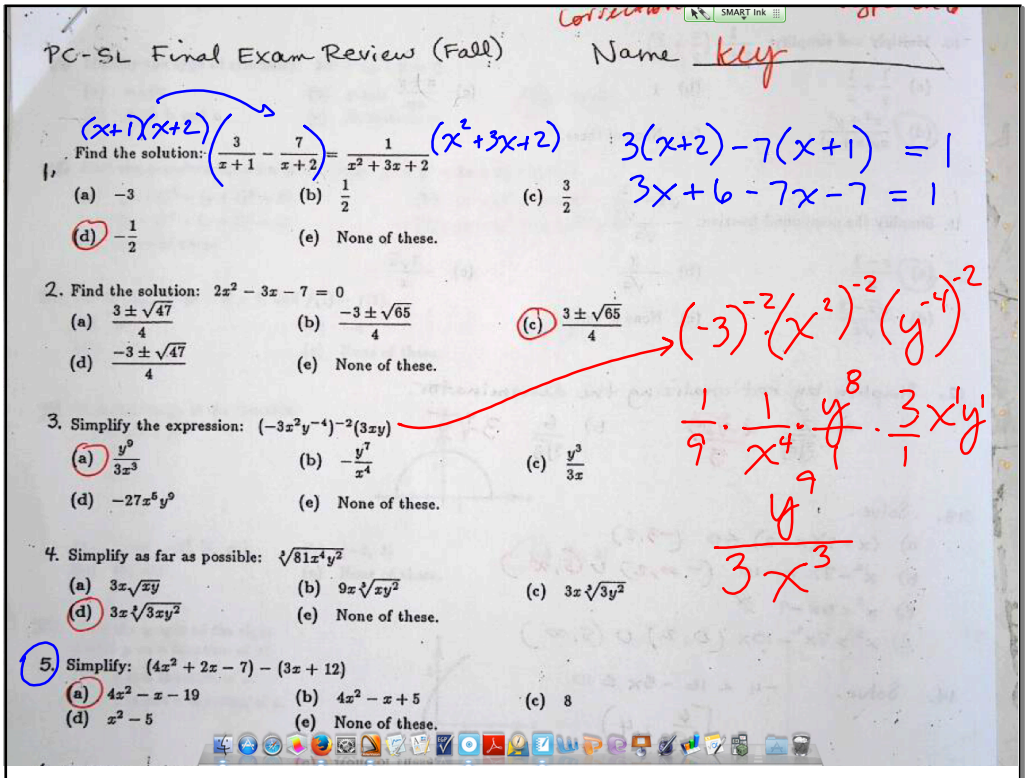
d) $(0, 2) \cup (5, \infty)$

14. $\frac{6}{5} \leq x < 4$

15. $\frac{x-6}{4x}$

16. b
17. d
18. c
19. c
20. d
21. a

22. c
23. b
24. c
25. c
26. b
27. c
28. a
29. d
30. c
31. d



PC-SL Final Exam Review (Fall) Name key

1. Find the solution: $\left(\frac{3}{x+1} - \frac{7}{x+2}\right) = \frac{1}{x^2+3x+2}$ $(x+1)(x+2)$ (x^2+3x+2)

$3(x+2) - 7(x+1) = 1$

$3x + 6 - 7x - 7 = 1$

(a) -3 (b) $\frac{1}{2}$ (c) $\frac{3}{2}$

(d) $-\frac{1}{2}$ (e) None of these.

2. Find the solution: $2x^2 - 3x - 7 = 0$

(a) $\frac{3 \pm \sqrt{47}}{4}$ (b) $\frac{-3 \pm \sqrt{65}}{4}$ (c) $\frac{3 \pm \sqrt{65}}{4}$

(d) $\frac{-3 \pm \sqrt{47}}{4}$ (e) None of these.

3. Simplify the expression: $(-3x^2y^{-4})^{-2}(3xy)$

$(-3)^{-2}(x^2)^{-2}(y^{-4})^{-2}$

$\frac{1}{9} \cdot \frac{1}{x^4} \cdot y^8 \cdot \frac{3}{1} x^1 y^1$

$\frac{y^9}{3x^3}$

(a) $\frac{y^9}{3x^3}$ (b) $-\frac{y^7}{x^4}$ (c) $\frac{y^3}{3x}$

(d) $-27x^5y^9$ (e) None of these.

4. Simplify as far as possible: $\sqrt[4]{81x^4y^2}$

(a) $3x\sqrt{xy}$ (b) $9x\sqrt[4]{xy^2}$ (c) $3x\sqrt[4]{3y^2}$

(d) $3x\sqrt[4]{3xy^2}$ (e) None of these.

5. Simplify: $(4x^2 + 2x - 7) - (3x + 12)$

(a) $4x^2 - x - 19$ (b) $4x^2 - x + 5$ (c) 8

(d) $x^2 - 5$ (e) None of these.

5. Simplify: $(4x^2 + 2x - 7) - (3x + 12)$

(a) $4x^2 - x - 19$ (b) $4x^2 - x + 5$ (c) 8

(d) $x^2 - 5$ (e) None of these.

6. Multiply: $(x^2 + 2)(x^2 + 3x - 1)$

(a) $(x^2 + 2)(x - 1)(x + 3)$ (b) $x^4 + 3x^3 + x^2 + 6x - 2$ (c) $x^4 + 3x^2 - 2x - 2$

(d) $x^4 + 6x^2 + 6x - 2$ (e) None of these.

7. Factor: $2x^2y + 8xy + 7x + 28y$ by grouping

$2xy(x+4y) + 7(x+4y)$

$(x+4y)(2xy+7)$

(a) $(2x^2y^2 + 4)(1 + 7y)$ (b) $(2xy + 7y)(x + 4)$ (c) $(x + 4y)(2xy + 7)$

(d) $(2xy + 4y)(x + 7)$ (e) None of these.

8. Find the solution interval(s): $|7x - 5| < 3$

(a) $x < \frac{8}{7}$ (b) $x < -\frac{8}{7}$ (c) $-\frac{8}{7} < x < \frac{8}{7}$

(d) $\frac{2}{7} < x < \frac{8}{7}$ (e) None of these.

9. Subtract: $\frac{2}{x-3} - \frac{1}{x+2}$ $\frac{(x+2)}{(x+2)}\frac{(x-3)}{(x-3)}$

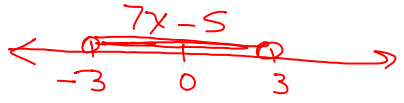
$2(x+2) - (x-3)$

$2x + 4 - x + 3 \rightarrow x + 7$

(a) $\frac{1}{(x-3)(x+2)}$ (b) $\frac{x-1}{(x-3)(x+2)}$ (c) $\frac{x+7}{(x-3)(x+2)}$

(d) $\frac{x+1}{(x-3)(x+2)}$ (e) None of these.

8)



$-3 < 7x - 5 < 3$

$+5 \quad +5 \quad +5$

10. Multiply and simplify: $\frac{1}{x+y}\left(\frac{x}{y} + \frac{y}{x}\right)$

(a) $\frac{1}{y} + \frac{1}{x}$ (b) 1 (c) $\frac{x+y}{xy}$

(d) $\frac{x^2 + y^2}{xy(x+y)}$ (e) None of these.

11. Simplify the compound fraction: $\frac{\frac{\sqrt{x}}{1} - \frac{3}{\sqrt{x}}}{\sqrt{x}}$ $\frac{\sqrt{x}}{\sqrt{x}}$

$= \frac{x-3}{\sqrt{x}} \cdot \frac{1}{\sqrt{x}} = \frac{x-3}{x}$

(a) $\frac{x-3}{x}$ (b) $-\frac{3}{\sqrt{x}}$ (c) $-\frac{3\sqrt{x}}{x}$

(d) $\frac{\sqrt{x}-3}{\sqrt{x}}$ (e) None of these.

12. Simplify by rationalizing the denominator.

a) $\frac{2}{\sqrt[3]{5}}$ $\frac{2\sqrt[3]{25}}{5}$ b) $\frac{6}{\sqrt[4]{8}}$ $3\sqrt[4]{2}$

13. Solve.

a) $(x+3)(x-2) < 0$ $(-3, 2)$ $-3 < x < 2$

b) $x^2 - 7x > -10$ $(-\infty, 2) \cup (5, \infty)$ $x < 2$ or $x > 5$

c) $x^2 < 6x - 9$ $\emptyset$

d) $x^3 > 7x^2 - 10x$ $(0, 2) \cup (5, \infty)$ $0 < x < 2$ or $x > 5$

14. Solve. $-4 < 16 - 5x \leq 10$

$[\frac{6}{5}, 4)$ $\quad \frac{6}{5} \leq x < 4$

15. Factor and simplify.

$$\frac{3x^3 - 15x^2 - 18x}{12x^3 + 12x^2} \qquad \frac{x-6}{4x}$$

$$\frac{3x(x^2 - 5x - 6)}{4 \cdot 12x^2(x+1)} = \frac{x(x+1)(x-6)}{4x^2(x+1)} = \frac{x-6}{4x}$$

16. Find the midpoint of the line segment joining the points $(-3, 1)$ and $(5, -7)$.

(a) $(-4, 4)$ (b) $(1, -3)$ (c) $(-4, -3)$
(d) $(1, 4)$ (e) None of these.

$d = \sqrt{(x-x)^2 + (y-y)^2}$

17. Find x so that the distance from the origin to the point $(x, 9)$ is 15. $(0,0)$

$15 = \sqrt{(x-0)^2 + (9-0)^2}$

$15^2 = x^2 + 81$

(a) $\pm 3\sqrt{34}$ (b) $\pm 2\sqrt{11}$ (c) ± 9
(d) ± 12 (e) None of these.

18. Find the x-intercept(s): $y = 2x^2 - 1$

(a) $\frac{1}{2}$ (b) -1 (c) $\pm\frac{\sqrt{2}}{2}$
(d) $\pm\sqrt{2}$ (e) None of these.

19. Identify the type of symmetry: $3x^4 + xy - 2 = 0$

(a) x-axis (b) y-axis (c) Origin
(d) Both b and c (e) No symmetry

$f(-x) = f(x)$

$(-x, y)$ $\quad (x, y)$

20. Find the standard equation of the circle: $x^2 + y^2 - 2x + 8y - 20 = 0$

(a) $(x-1)^2 + (y+4)^2 = 20$ (b) $(x-1)^2 + (y+4)^2 = 3$
(c) $(x-2)^2 + (y+8)^2 = 48$ (d) $(x-1)^2 + (y+4)^2 = 37$
(e) None of these.

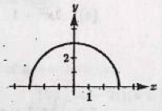
21. Given $f(x) = |x - 3| - 5$, find $f(1) - f(5)$.

(a) 0 (b) -4 (c) 14
(d) -14 (e) None of these.

$(-x, -y)$

$f(-x) = -f(x)$

22. Find the range of the function: $y = \sqrt{9 - x^2}$

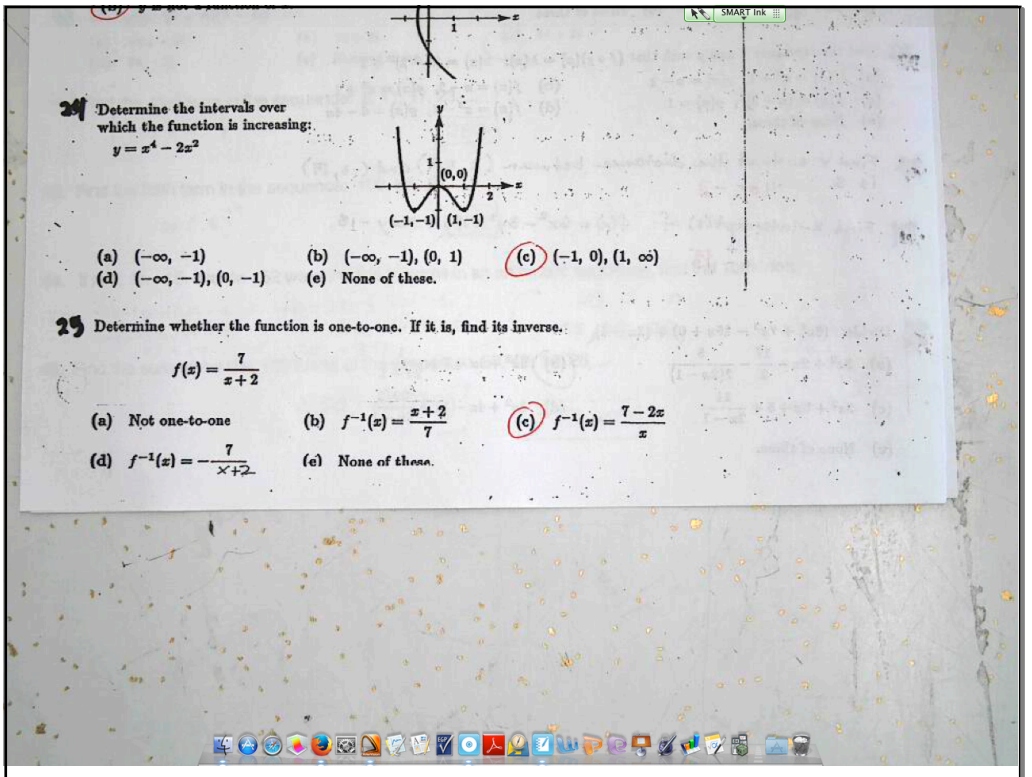


(a) $(-\infty, -3], [3, \infty)$ (b) $[-3, 3]$ (c) $[0, 3]$
(d) $[3, \infty)$ (e) None of these.

23. Does the graph to the right depict y as a function of x?

(a) y is a function of x.
(b) y is not a function of x.

24. Determine the



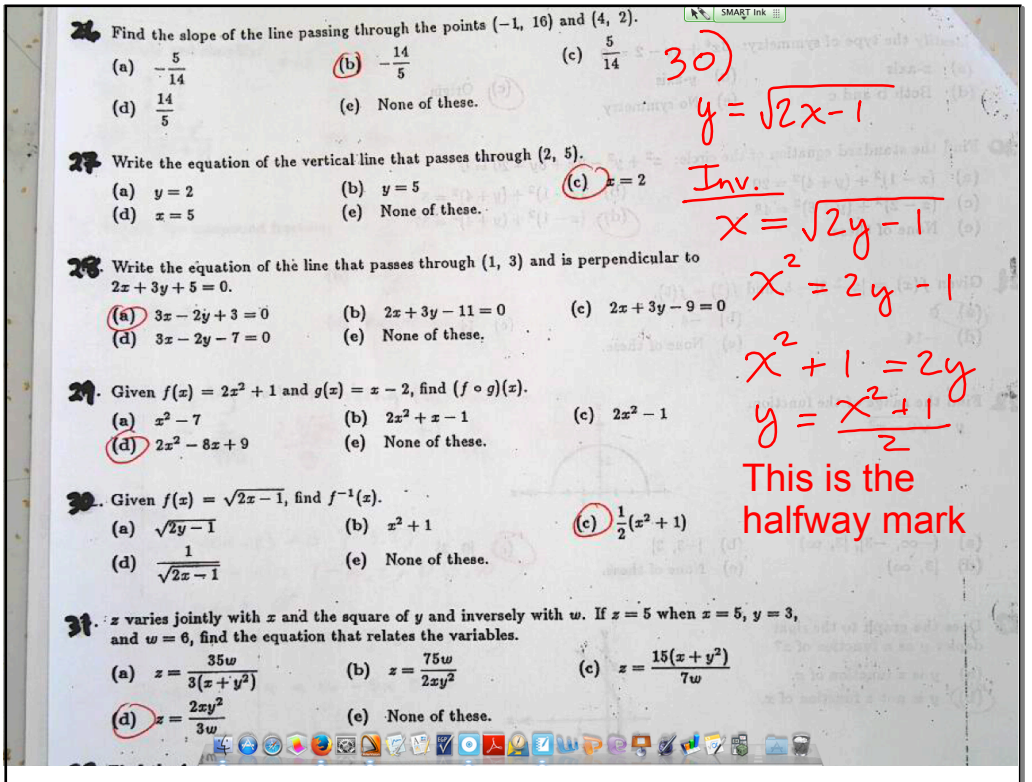
24. Determine the intervals over which the function is increasing:
$y = x^4 - 2x^2$

(a) $(-\infty, -1)$ (b) $(-\infty, -1), (0, 1)$ (c) $(-1, 0), (1, \infty)$
(d) $(-\infty, -1), (0, -1)$ (e) None of these.

25. Determine whether the function is one-to-one. If it is, find its inverse.

$$f(x) = \frac{7}{x+2}$$

(a) Not one-to-one (b) $f^{-1}(x) = \frac{x+2}{7}$ (c) $f^{-1}(x) = \frac{7-2x}{x}$
(d) $f^{-1}(x) = -\frac{7}{x+2}$ (e) None of these.



26. Find the slope of the line passing through the points $(-1, 16)$ and $(4, 2)$.

(a) $-\frac{5}{14}$ (b) $-\frac{14}{5}$ (c) $\frac{5}{14}$
(d) $\frac{14}{5}$ (e) None of these.

27. Write the equation of the vertical line that passes through $(2, 5)$.

(a) $y = 2$ (b) $y = 5$ (c) $x = 2$
(d) $x = 5$ (e) None of these.

28. Write the equation of the line that passes through $(1, 3)$ and is perpendicular to $2x + 3y + 5 = 0$.

(a) $3x - 2y + 3 = 0$ (b) $2x + 3y - 11 = 0$ (c) $2x + 3y - 9 = 0$
(d) $3x - 2y - 7 = 0$ (e) None of these.

29. Given $f(x) = 2x^2 + 1$ and $g(x) = x - 2$, find $(f \circ g)(x)$.

(a) $x^2 - 7$ (b) $2x^2 + x - 1$ (c) $2x^2 - 1$
(d) $2x^2 - 8x + 9$ (e) None of these.

30. Given $f(x) = \sqrt{2x - 1}$, find $f^{-1}(x)$.

(a) $\sqrt{2y - 1}$ (b) $x^2 + 1$ (c) $\frac{1}{2}(x^2 + 1)$
(d) $\frac{1}{\sqrt{2x - 1}}$ (e) None of these.

31. z varies jointly with x and the square of y and inversely with w. If $z = 5$ when $x = 5$, $y = 3$, and $w = 6$, find the equation that relates the variables.

(a) $z = \frac{35w}{3(x + y^2)}$ (b) $z = \frac{75w}{2xy^2}$ (c) $z = \frac{15(x + y^2)}{7w}$
(d) $z = \frac{2xy^2}{3w}$ (e) None of these.

30) $y = \sqrt{2x - 1}$

Inv.

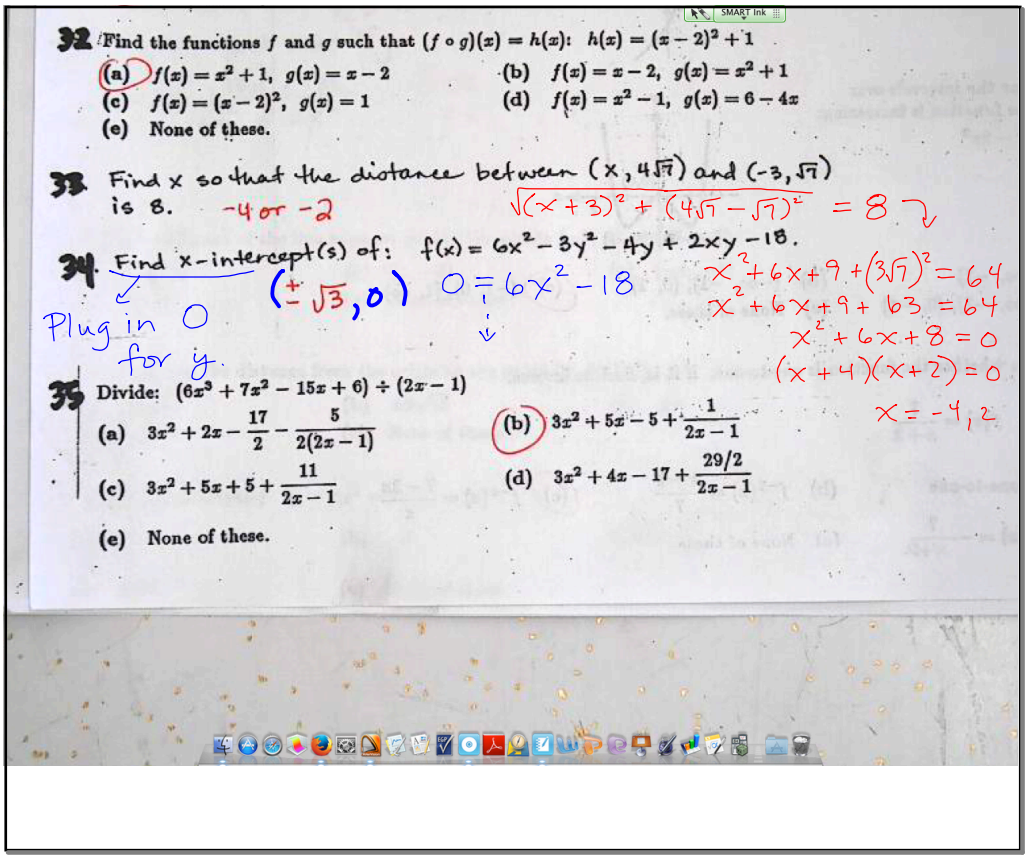
$x = \sqrt{2y - 1}$

$x^2 = 2y - 1$

$x^2 + 1 = 2y$

$y = \frac{x^2 + 1}{2}$

This is the halfway mark



32 Find the functions f and g such that $(f \circ g)(x) = h(x)$: $h(x) = (x-2)^2 + 1$

(a) $f(x) = x^2 + 1,\ g(x) = x - 2$ (b) $f(x) = x - 2,\ g(x) = x^2 + 1$

(c) $f(x) = (x-2)^2,\ g(x) = 1$ (d) $f(x) = x^2 - 1,\ g(x) = 6 - 4x$

(e) None of these.

33 Find x so that the distance between $(x, 4\sqrt{7})$ and $(-3, \sqrt{7})$ is 8. -4 or -2

$\sqrt{(x+3)^2 + (4\sqrt{7} - \sqrt{7})^2} = 8$

34 Find x-intercept(s) of: $f(x) = 6x^2 - 3y^2 - 4y + 2xy - 18$.

Plug in 0 for y.

$(\pm\sqrt{3}, 0)$ $0 = 6x^2 - 18$

$x^2 + 6x + 9 + (3\sqrt{7})^2 = 64$

$x^2 + 6x + 9 + 63 = 64$

$x^2 + 6x + 8 = 0$

$(x+4)(x+2) = 0$

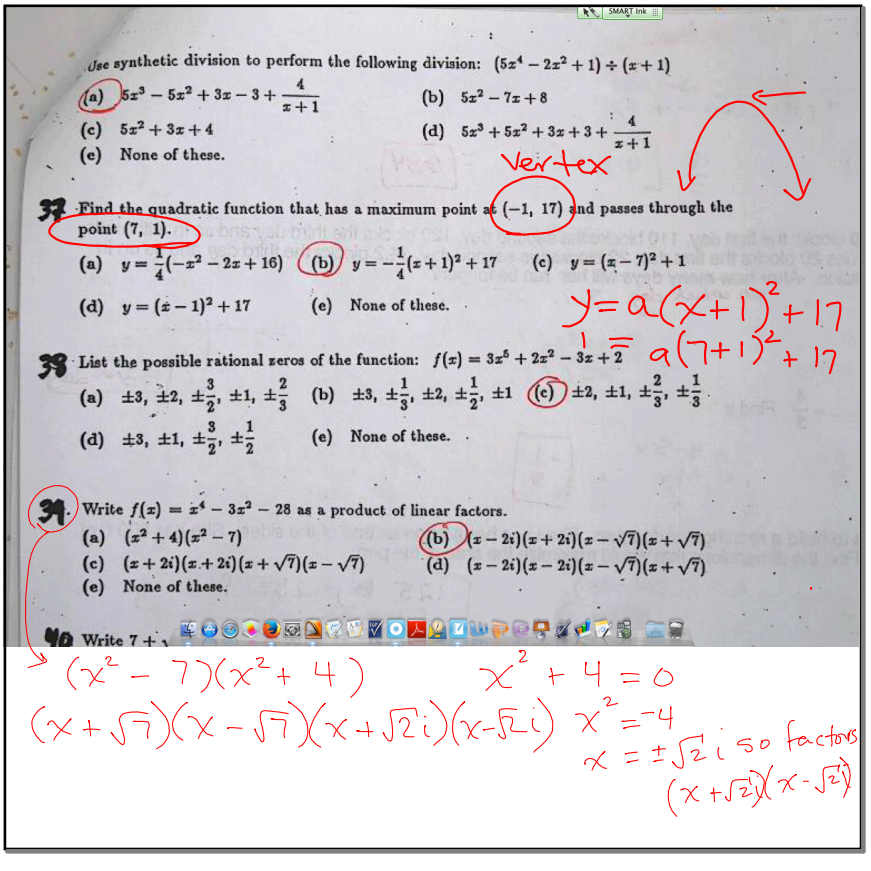
$x = -4, 2$

35 Divide: $(6x^3 + 7x^2 - 15x + 6) \div (2x - 1)$

(a) $3x^2 + 2x - \frac{17}{2} - \frac{5}{2(2x-1)}$ (b) $3x^2 + 5x - 5 + \frac{1}{2x-1}$

(c) $3x^2 + 5x + 5 + \frac{11}{2x-1}$ (d) $3x^2 + 4x - 17 + \frac{29/2}{2x-1}$

(e) None of these.



Use synthetic division to perform the following division: $(5x^4 - 2x^2 + 1) \div (x + 1)$

(a) $5x^3 - 5x^2 + 3x - 3 + \frac{4}{x+1}$ (b) $5x^2 - 7x + 8$

(c) $5x^2 + 3x + 4$ (d) $5x^3 + 5x^2 + 3x + 3 + \frac{4}{x+1}$

(e) None of these.

Vertex

37 Find the quadratic function that has a maximum point at $(-1, 17)$ and passes through the point $(7, 1)$.

(a) $y = \frac{1}{4}(-x^2 - 2x + 16)$ (b) $y = -\frac{1}{4}(x+1)^2 + 17$ (c) $y = (x-7)^2 + 1$

(d) $y = (x-1)^2 + 17$ (e) None of these.

$y = a(x+1)^2 + 17$

$1 = a(7+1)^2 + 17$

38 List the possible rational zeros of the function: $f(x) = 3x^5 + 2x^2 - 3x + 2$

(a) $\pm 3, \pm 2, \pm\frac{3}{2}, \pm 1, \pm\frac{2}{3}$ (b) $\pm 3, \pm\frac{1}{3}, \pm 2, \pm\frac{1}{2}, \pm 1$ (c) $\pm 2, \pm 1, \pm\frac{2}{3}, \pm\frac{1}{3}$

(d) $\pm 3, \pm 1, \pm\frac{3}{2}, \pm\frac{1}{2}$ (e) None of these.

39 Write $f(x) = x^4 - 3x^2 - 28$ as a product of linear factors.

(a) $(x^2 + 4)(x^2 - 7)$ (b) $(x - 2i)(x + 2i)(x - \sqrt{7})(x + \sqrt{7})$

(c) $(x + 2i)(x + 2i)(x + \sqrt{7})(x - \sqrt{7})$ (d) $(x - 2i)(x - 2i)(x - \sqrt{7})(x + \sqrt{7})$

(e) None of these.

40 Write $7 + \ldots$

$(x^2 - 7)(x^2 + 4)$ $x^2 + 4 = 0$

$(x + \sqrt{7})(x - \sqrt{7})(x + \sqrt{2}i)(x - \sqrt{2}i)$ $x^2 = -4$

$x = \pm\sqrt{2}i$, so factors $(x + \sqrt{2}i)(x - \sqrt{2}i)$

40. Write $7 + \sqrt{-16}$ in standard form.
(a) $7 + 4i$ (b) $7 - 4i$ (c) 11
(d) 3 (e) None of these.

41. Multiply: $(3 + 7i)(2 - 4i)$
(a) $-22 + 2i$ (b) $22 + 2i$ (c) $34 + 2i$
(d) $34 - 2i$ (e) None of these.

42. Find the 43rd term in the sequence: 5, 11, 17, 23, ...

$5 + 6(42)$ 257

$r = \frac{80}{100} = 0.8$

43. Find the 20th term in the sequence: 100, 80, 64, ...

$100(.8)^{19}$ $\approx$ 1.44

$r = \frac{64}{80}$

44. If n+2, 2n - 15, and 4n - 52 were the first 3 terms in an arithmetic sequence, find the 10th term.

$2n - 15 - (n+2) = 4n - 52 - (2n - 15)$
$2n - 15 - n - 2 = 4n - 52 - 2n + 15$
$n - 17 = 2n - 37$

$20 = n$
22, 25, 28, ...
$22 + 3$
49

45. Find the sum of the first 100 terms of the sequence: 50, 42, 34, 26,...

$\frac{100}{2}[2(50) - 8(99)]$ -34,600

40. Write $7 + \sqrt{-16}$ in standard form.
(a) $7 + 4i$ (b) $7 - 4i$ (c) 11
(d) 3 (e) None of these.

41. Multiply: $(3 + 7i)(2 - 4i)$
(a) $-22 + 2i$ (b) $22 + 2i$ (c) $34 + 2i$
(d) $34 - 2i$ (e) None of these.

42. Find the 43rd term in the sequence: 5, 11, 17, 23, ...

$5 + 6(42)$ 257

43. Find the 20th term in the sequence: 100, 80, 64, ...

$100(.8)^{19}$ $r = 0.8$ $\approx$ 1.44

44. If n+2, 2n - 15, and 4n - 52 were the first 3 terms in an arithmetic sequence, find the 10th term.

$2n - 15 - (n+2) = 4n - 52 - (2n - 15)$
$2n - 15 - n - 2 = 4n - 52 - 2n + 15$
$n - 17 = 2n - 37$

$20 = n$
22, 25, 28, ...
$22 + 3$
49

45. Find the sum of the first 100 terms of the sequence: 50, 42, 34, 26,...

$\frac{100}{2}[2(50) - 8(99)]$ -34,600

$a_n = a_1 + d(n-1)$

$a_{43} = 5 + 6(42)$

$g_n = g_1(r)^{(n-1)}$

$g_{20} = 100(.8)^{19}$

a_1, a_2

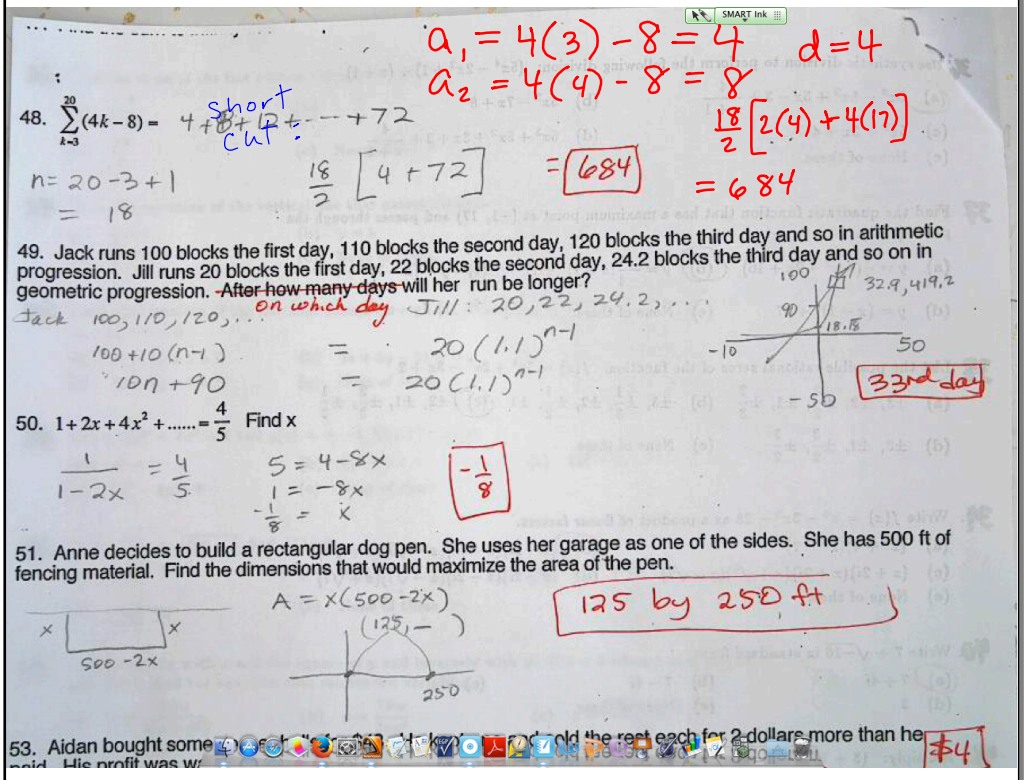
$d = 3$

$a_{10} = 22 + 3(9)$

$S_{100} = \frac{100}{2}[2(50) - 8(99)]$

$\frac{n}{2}[2a_1 + d(n-1)]$

47. Sum to infinity for problem 46:



48. $\sum_{k=3}^{20}(4k-8) =$ $4+8+12+\cdots+72$ (Short Cut)

$n = 20-3+1 = 18$

$\frac{18}{2}[4+72] = 684$

$a_1 = 4(3)-8 = 4 \quad d = 4$

$a_2 = 4(4)-8 = 8$

$\frac{18}{2}[2(4)+4(17)] = 684$

49. Jack runs 100 blocks the first day, 110 blocks the second day, 120 blocks the third day and so in arithmetic progression. Jill runs 20 blocks the first day, 22 blocks the second day, 24.2 blocks the third day and so on in geometric progression. ~~After how many days~~ on which day will her run be longer?

Jack $100, 110, 120, \ldots$

$100+10(n-1) = 10n+90$

Jill: $20, 22, 24.2, \ldots$

$20(1.1)^{n-1} = 20(1.1)^{n-1}$

33rd day

50. $1+2x+4x^2+\ldots = \frac{4}{5}$ Find x

$\frac{1}{1-2x} = \frac{4}{5}$

$5 = 4-8x$

$1 = -8x$

$-\frac{1}{8} = x$

$-\frac{1}{8}$

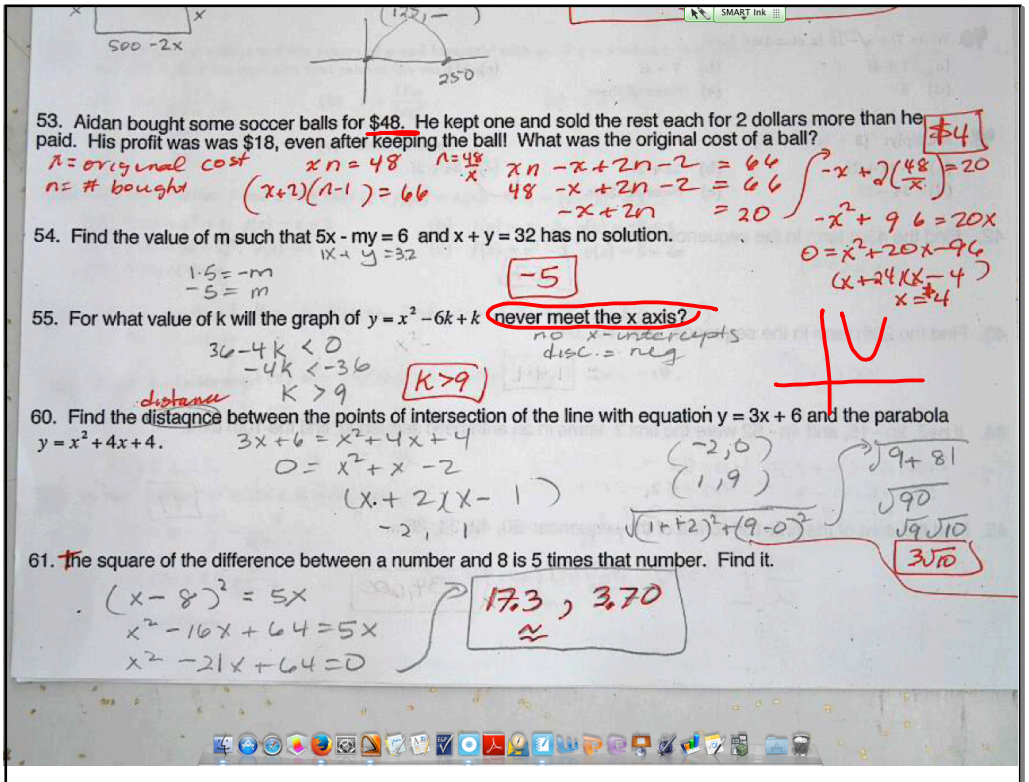
51. Anne decides to build a rectangular dog pen. She uses her garage as one of the sides. She has 500 ft of fencing material. Find the dimensions that would maximize the area of the pen.

$A = x(500-2x)$

125 by 250 ft

53. Aidan bought some [illegible] and sold the rest each for 2 dollars more than he paid. His profit was w[illegible]

$4



53. Aidan bought some soccer balls for $48. He kept one and sold the rest each for 2 dollars more than he paid. His profit was was $18, even after keeping the ball! What was the original cost of a ball?

$4

x = original cost

n = # bought

$xn = 48 \quad n = \frac{48}{x}$

$(x+2)(n-1) = 66$

$xn - x + 2n - 2 = 66$

$48 - x + 2n - 2 = 66$

$-x + 2n = 20$

$-x + 2\left(\frac{48}{x}\right) = 20$

$-x^2 + 96 = 20x$

$0 = x^2 + 20x - 96$

$(x+24)(x-4)$

$x = -24, 4$

54. Find the value of m such that $5x - my = 6$ and $x + y = 32$ has no solution.

$1 \cdot 5 = -m$

$-5 = m$

-5

55. For what value of k will the graph of $y = x^2 - 6k + k$ never meet the x axis?

no x-intercepts

disc. = neg

$36 - 4k < 0$

$-4k < -36$

$k > 9$

$k > 9$

60. Find the distance between the points of intersection of the line with equation $y = 3x + 6$ and the parabola $y = x^2 + 4x + 4$.

$3x + 6 = x^2 + 4x + 4$

$0 = x^2 + x - 2$

$(x+2)(x-1)$

$-2, 1$

$(-2, 0) \quad (1, 9)$

$\sqrt{(1+2)^2 + (9-0)^2}$

$\sqrt{9+81}$

$\sqrt{90}$

$\sqrt{9}\sqrt{10}$

$3\sqrt{10}$

61. The square of the difference between a number and 8 is 5 times that number. Find it.

$(x-8)^2 = 5x$

$x^2 - 16x + 64 = 5x$

$x^2 - 21x + 64 = 0$

$17.3, 3.70$

$\approx$